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# Adventive Staphylinidae (Coleoptera) of the Maritime Provinces of Canada: further contributions

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## Abstract

Seven species of adventive Palaearctic staphylinids, *Ilyobates bennetti* Donisthorpe, *Meotica exilis* (Knoch), *Meotica "pallens"* (Redtenbacher), *Anotylus insecatus* (Gravenhorst), *Anotylus tetracarinatus* Block, *Oxytelus sculptus* Gravenhorst, and *Lathrobium fulvipenne* (Gravenhorst) are newly recorded in the Maritime Provinces of Canada. One of these, *M. exilis*, a cosmopolitan species, is newly recorded in Canada and represents the first verifiable report of this species from North America. The history of *M. exilis* in North America is examined indicating that previous reports were the result of misidentification or of specimens of uncertain identity that can no longer be located. The confused nomenclature of this species is also discussed. The confused taxonomy of *Meotica "pallens"* is discussed with regard to the identity of the species reported under this name in North America. *Atheta dadopora* Thomson is newly recorded in Prince Edward Island. Records are provided that establish the presence of *L. fulvipenne* in North America in five Canadian provinces. Observations on *A. insecatus* in the field have established that they are predators of dipteran larvae. New early dates of detection are reported for *Quedius curtipennis* Bernhauer, *Tasgius ater* (Gravenhorst), *Philonthus cognatus* Stephens, and *Philonthus rectangulus* Sharp. As a consequence, 87 species of adventive Staphylinidae are now known to occur in the Maritime Provinces, 76 of which have been recorded in Nova Scotia, 61 in New Brunswick, and 29 on Prince Edward Island. The staphylinid fauna is briefly discussed in relation to its zoogeographic components and its regional composition.

## Keywords

Coleoptera, Staphylinidae, *Ilyobates*, *Meotica*, *Anotylus*, *Oxytelus*, *Lathrobium*, introduced species, adventive species, new records

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## Introduction

Introduced insects have been a topic of interest and concern in Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland) for almost two centuries. In the first paper on Coleoptera of the region Kirby (1837) included five adventive species (*Philonthus politus, Attagenus pellio, Dermestes lardarius, Gastrophysa polygoni*, and *Tenebrio molitor*) amongst the 42 species reported from Nova Scotia. Throughout the nineteenth century authors such as Jones (1870), Harrington (1891), and Evans (1899) continued to record adventive beetles in Nova Scotia. The collections of Peter Stuwitz made in Newfoundland between 1839 and 1842 are still extant and include specimens of *Bembidion ustulatum, Agonum ruficorne, Agonum muelleri,* and *Harpalus affinis*, four adventive Palaearctic species amongst the 17 species of Carabidae collected by him (Lindroth 1955). Recent archeological studies in Ferryland on the Avalon Peninsula of in Newfoundland Prévost and Bain (2006) revealed the remains of eight Palaearctic beetles including *Quedius mesomelinus, Cercyon analis, Ptinus fur, Tipnus unicolor, Orzaephilus surinamensis, Mycaetaea subterranean, Latridius minutus,* and *Sitophilus granarius* in the excavations of a latrine used between 1621 and 1673. All these studies indicate that adventive beetles have long been components of the fauna of Atlantic Canada.

Brown (1950) and Lindroth (1957) developed the theory that many adventive species, particularly terricolous ones, had been introduced to the New World through the importation of dry ballast. Brown (1950) noted that large quantities of dry ballast (bulky rock, sand, and soil) were unloaded at ports in Atlantic Canada by British vessels that returned to Europe carrying timber. Regulations required that this dry ballast be offloaded onshore, and with it the animals and plants that had been excavated from quarries. Lindroth (1957) investigated this topic further, conducting surveys at eight principal sites in Great Britain known to have been sources of ballast in the trans-Atlantic shipping trade. Twenty species of staphylinids found at these sites are currently known as adventive species in Atlantic Canada.

Atlantic Canada is known as a region that has substantial numbers of adventive species. In a survey of the weevils (Curculionoidea) of the Maritime Provinces Majka et al. (2007a) identified 60 adventive species, 21% of the regional fauna. Majka (2007) found that 37 species of Bostrichiformia (Anobiidae, Bostrichidae, Dermestidae, and Derodontidae) were adventive, 50% of the regional fauna. In a survey of the ground beetles (Carabidae) of the region, Majka et al. (2007b) found that 34 species, 10.3% of the fauna, were adventive. All these studies indicate the importance of adventive beetles in the composition of the region's fauna. Adventive species represent a substantial portion of the known beetle fauna of New Brunswick, Nova Scotia, and Prince Edward Island: 12.3 %, 15.3%, and 21.7%, respectively (unpublished data).

Majka and Klimaszewski (2008) surveyed the adventive Staphylinidae of the Maritime Provinces of Canada (New Brunswick, Nova Scotia, and Prince Edward Island). They reported 79 species as occurring in the region, including 73 that have been found in Nova Scotia, 29 on Prince Edward Island, and 54 in New Brunswick. Since that

paper was published, further records of adventive species have come to light and continuing studies have forced a revaluation of the zoogeographic status of some species. In this volume, Klimaszewski et al. (2008a) report two additional adventive species. The discoveries of new voucher specimens in collections have established new early timelines for a number of species. Consequently, in the present study we continue the investigation of this important group of adventive beetles in the Maritime Provinces.

## Methods and conventions

Codens (following Evenhuis 2007) of collections referred to in this study are:

**CBU** Cape Breton University, Sydney, Nova Scotia, Canada
**CFNL** Canadian Forest Service, Corner Brook, Newfoundland and Labrador, Canada
**CGMC** Christopher G. Majka collection, Halifax, Nova Scotia, Canada
**CLC** Claire Levesque Collection, Fleurimont, Québec, Canada
**CNC** Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
**DHWC** David H. Webster collection, Kentville, Nova Scotia, Canada
**FMNH** Field Museum of Natural History, Chicago, Illinois, USA
**LFC** Laurentian Forestry Centre, Québec City, Québec, Canada
**MUN** Memorial University of Newfoundland collection, St. John's, Newfoundland, Canada (currently on long term loan to the Canadian Forest Service, Edmonton, Alberta)
**NBM** New Brunswick Museum, Saint John, New Brunswick, Canada
**NSAC** Nova Scotia Agricultural College, Bible Hill, Nova Scotia, Canada
**NSMC** Nova Scotia Museum, Halifax, Nova Scotia, Canada
**NSNR** Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia, Canada
**RWC** Reginald Webster Collection, Charters Settlement, New Brunswick, Canada
**UASM** Strickland Entomological Museum, University of Alberta, Edmonton, Alberta, Canada

The number of specimens is indicated in brackets. The systematics and taxonomy follow that of Newton et al. (2000); the systematics of the Aleocharinae follow Gouix and Klimaszewski (2007).

## Results

Seven species of adventive staphylinids, *Ilyobates bennetti* Donisthorpe, *Meotica exilis* (Knoch), *Meotica "pallens"* (Redtenbacher), *Anotylus insecatus* (Gravenhorst), *Anotylus tetracarinatus* Block, *Oxytelus sculptus* Gravenhorst, and *Lathrobium fulvipenne*

(Gravenhorst) are newly recorded in the Maritime Provinces. *Meotica exilis*, newly recorded in Canada, represents the first verifiable report of this species in North America. Records are provided that establish the presence of *L. fulvipenne* in North America in five Canadian provinces. Observations on *A. insecatus* in the field establish that they are predators of dipteran larvae. *Atheta dadopora* Thomson is newly recorded in Prince Edward Island. New records of both *Leptacinus intermedius* Donisthorpe and *Neobisnius villosulus* (Stephens) are provided that establish the presence of these species in New Brunswick. New early dates of detection are reported for *Quedius curtipennis* Bernhauer, *Tasgius ater* (Gravenhorst), *Philonthus cognatus* Stephens, and *Philonthus rectangulus* Sharp. *Cilea silphoides* (Linnaeus) and *Philonthus jurgans* Tottenham, previously reported from the region, are added to the fauna of adventive species, whereas *Staphylinus ornaticauda* LeConte and *Creophilus maxillosus* (Linnaeus), native staphylinids previously listed as adventive in Majka and Klimaszewski (2008), and *Gnypeta caerulea* (C.R. Sahlberg), now considered a Holarctic species, are removed from the regional fauna of adventive species. As a consequence, 87 species of adventive Staphylinidae are now known to occur in the Maritime Provinces, 76 of which have been recorded in Nova Scotia, 61 in New Brunswick, and 29 on Prince Edward Island (Appendix 1). Specific details follow.

***Cilea silphoides*** (Linnaeus, 1767)

**NEW BRUNSWICK: Kent Co.:** Kouchibouguac National Park, 25.VII.1978, I. Smith, (1, CNC).

*Cilea silphoides* is a European species long known in North America. It was first recorded on the continent by Gravenhorst (1802) under the name *Tachinus marginalis* and was later described by Randall (1838) under the name *Tachinus geminatus* from specimens collected in Brookline, Massachusetts. In Canada, Campbell (1975) recorded it from British Columbia, Alberta, Ontario, and Québec. It was reported from New Brunswick by Campbell and Davies (1991) on the basis of the record given above (Fig. 5). *Cilea silphoides* is widely distributed in Europe from France and England east to Bulgaria, the Ukraine, and eastern Russia and north to Fennoscandia (Alonso-Zarazaga 2007). It is also found throughout Africa, from Iran east throughout Southeast Asia and north to China, Korea, and Japan, and in the West Indies (Herman 2001). It is usually found in piles of rotting vegetable matter such as compost heaps, grass cuttings, rotting fruit, haystacks, piles of straw, and in dung and old mushrooms (Horion 1967).

***Tachyporus nitidulus*** (Fabricius, 1781)

*Tachyporus nitidulus* has been considered an adventive species (i.e., Majka and Klimaszewski 2008). According to Campbell (1979), *T. nitidulus* may represent a species complex of two or more species. He suggested that one species or population (lighter

in colour with a shorter elytra having less distinct microsculpture, non-functional wings, and submedian bristles on the fifth and sixth abdominal tergites) may represent an indigenous North American one, whereas another (darker in colour, with a longer elytra with distinct microsculpture, fully developed wings, and lacking submedian bristles on the fifth and sixth abdominal tergites) may represent an adventive Palaearctic one. The ranges of these two forms broadly overlap and there are also occasional specimens with mixed features. Volker Assing (pers. comm.), however, indicates that both forms are found in Europe. Thus, although the status of *T. nitidulus* requires further research, we retain it as a Palaearctic species.

***Ilyobates bennetti*** Donisthorpe, 1914

**NOVA SCOTIA: Colchester Co.:** Bible Hill, 13-19.VI.2007, C.W. D'Orsay, pasture, pitfall trap, (3, CBU); Bible Hill, 3-9.VII.2007, C.W. D'Orsay, pasture, pitfall trap, (2, CBU); **Hants Co.:** Upper Rawdon, 26.VI.2008, J. Renkema, blueberry field, pitfall trap, (1, CGM).

*Ilyobates bennetti* is newly recorded for Nova Scotia and in the Maritime Provinces (Fig. 1). Figure 2 provides a dorsal habitus photograph. The only previous records of this species in North America are two specimens from Ste. Clothilde (1981) and

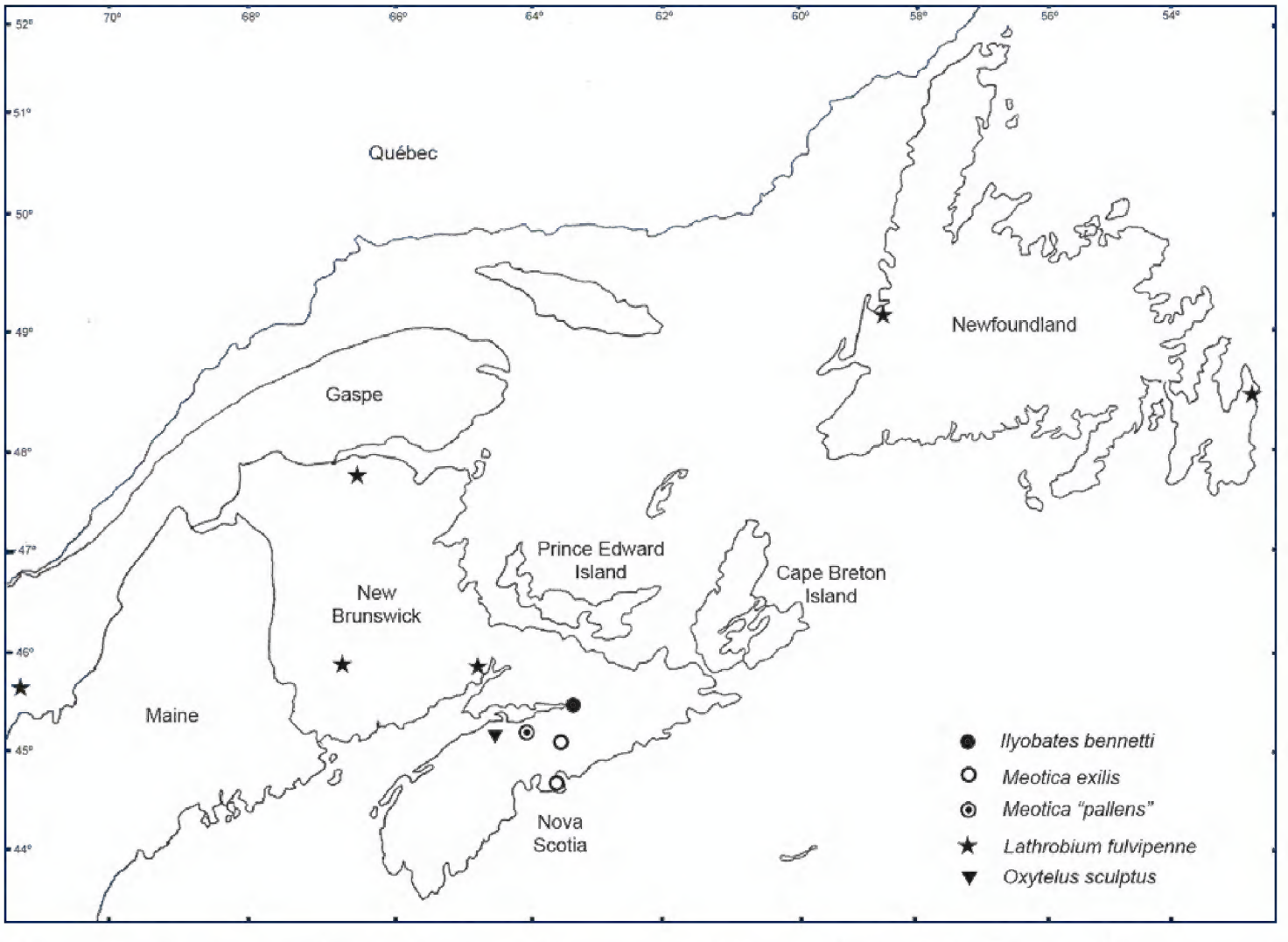


**Fig. 1.** Distribution of *Ilyobates bennetti, Meotica exilis, Meotica "pallens," Lathrobium fulvipenne,* and *Oxytelus sculptus* in eastern Canada.

**Fig. 2.** Dorsal habitus photograph of *Ilyobates bennetti* (from Gouix and Klimaszewski 2007).

Frelighsburg (1984) (Québec) (Assing (1999). It is very widely distributed in Europe and in the Caucasus. In Europe it occurs in a variety of open habitats, particularly synanthropic ones, such as urban meadows, lawns, fallow areas, gardens, strip mines, and in pioneer vegetation; it is also found in swamps, bogs, flood plains, riverbanks, meadows, grasslands, in leaf litter, moss, grass, compost, rotting debris, and under reeds and ferns (Assing 1999).

***Meotica exilis*** (Knoch, 1806)

**NOVA SCOTIA: Colchester Co.:** Shubenacadie, 2.VI.2006, J. Ogden, flight-intercept trap, (1 female, NSNR) (1 male, LFC); **Halifax Co.:** Point Pleasant Park, 6.V.2003, C.G. Majka, coniferous forest, under bark of dead *Pinus strobus*, (1 female, CGMC) (1 male, LFC); **Hants Co.:** Frenchman's Cave, 2.VII.1998, M. Moseley, gypsum sinkhole, (1 male, CGMC).

These represent the first verifiable records of this species in North America (see below) (Fig. 1). The specimens collected in Point Pleasant Park were found in scolytine galleries under the bark of a dead white pine (*Pinus strobus* L., Pinaceae). Co-inhabiting Coleoptera included *Nudobius cephalus* (Say, 1834) (Staphylinidae); and *Polygraphus rufipennis* (Kirby, 1837) and *Pityophthorus cariniceps* LeConte, 1876 (Curculionidae: Scolytinae). The specimen at Frenchman's Cave was collected in a wet, mossy area in a gypsum sinkhole.

Muona (1991, 239) wrote, "Small aleocharine species are often regarded as difficult to identify. However, it is doubtful (whether) there exists a species with a more confused history (than) that of *Meotica exilis*." Prior reports of its presence in North America have proven to be no exception to this rule.

It appears to have first been reported in North America by Leng (1920) followed by Bernhauer and Scheerpeltz (1926). These specimens were examined by Seevers (1978: 79) who wrote, "The record of *Meotica exilis* Erichson (a European species) in Maine (E. Machias, and Wales) is *probably* (emphasis added) a valid one. I examined the specimens in the Bernhauer collection on which the record was based and found that they do belong to *Meotica*, and are *probably* (emphasis added) *exilis*. These specimens *probably* (emphasis added) represent an introduction." Muona (1984: 228) did not accept the validity of this record noting that, "*Meotica* is a

difficult genus with many species and Seevers' (1978) statement is quite vague." Muona (1984) also pointed out that specimens identified as *Meotica exilis* by Fenyes from Pasadena, California (deposited in various European collections and at the FMNH), are in fact a species of the genus *Thecturota*, Casey. Despite this tenuous or erroneous evidence, *M. exilis* has continued to be included in the North America fauna in such recent compendiums as Ashe (2000).

The Bernhauer collection is now deposited in the Field Museum of Natural History (FMNH). Margaret Thayer kindly checked the collection and wrote (pers. comm.) that she was able to find one pin with the label: "E. Machias,/ Me.// June//[white circle]//**exilis Grvh./Fenyes**/det. Bernhauer//Chicago NHMus/M.Bernhauer/". The text in boldface is in Bernhauer's writing, apparently relaying Fenyes as the source of the specimen, the identification, or perhaps both. However, there is no longer any specimen on the pin; the card point has been cut off. There is also no specimen from "Wales, Maine" in the FMNH collection and the present disposition of this specimen is unknown.

**Fig. 3.** Dorsal habitus photograph of *Meotica exilis*. Scale = 1 mm.

Thus, all prior reports of this species in North America appear to have been based on misidentifications, or can no longer be verified because voucher specimens can no longer be located. Therefore, the present specimens from Nova Scotia constitute the first verifiable records of this species on the continent.

The authority of the specific name of *M. exilis* has also been in doubt. It has been referred to as *M. exilis* (Erichson, 1839: 333) (see Leng 1920; Bernhauer and Scheerpeltz 1926; Moore and Legner 1975); and *M. exilis* (Gravenhorst, 1806) (Seevers 1978; Smetana 2004a). Muona (1991), however, argued that the species should be called *M. exilis* (Knoch in Gravenhorst, 1806: 153). Although Gravenhorst cited many Knoch manuscript names without crediting Knoch (thus making Gravenhorst the author), the case of *M. exilis* is an exception to the rule because Gravenhorst explicitly credited Knoch with the description.

*Meotica exilis* is found throughout Europe and northern Asia. It occurs in many kinds of moist situations, preferring rich soils and frequenting shores with dense vegetation and is abundant in leaf-litter under *Salix* bushes and has been collected in *Sphagnum* bogs (Muona 1991). A dorsal habitus photograph is provided in Fig. 3. For illustrations of the genitalia see Klimaszewski et al. (2007).

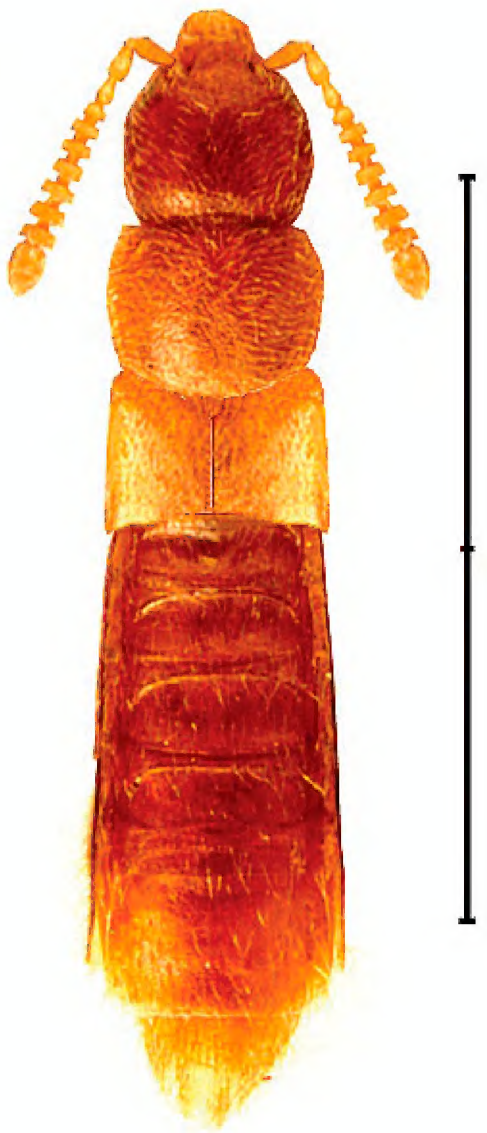

**Fig. 4.** Dorsal habitus photograph of *Meotica "pallens" sensu* Benick and Lohse (1974)

***Meotica "pallens"*** (Redtenbacher, 1849) *sensu* Benick and Lohse (1974)

**NOVA SCOTIA: Hants Co.:** St. Croix, 28.VII. 2007, M. Moseley, in wet moss in a gypsum sinkhole, (1 female, NSMC).

This species is newly recorded for Nova Scotia and the Maritime Provinces (Fig. 1). In North America it has previously been recorded from British Columbia, New Jersey, Ontario, and Rhode Island (Gouix and Klimaszewski 2007;Klimaszewski et al. 2007). The earliest North American specimen was collected at the end of the 19th century by Casey in Rhode Island and was described by him as *Sipaliella filaria* Casey, 1911, which was subsequently synonymized with *M. pallens* by Gusarov (2002).

The concept of *Meotica pallens* (Redtenbacher) in Europe is problematic. Canadian specimens are conspecific with the central European specimens cited as *M. pallens* (Redtenbacher) *sensu* Benick and Lohse (1974) (Klimaszewski et al. 2007). According to Muona (1991), *M. pallens* (Redtenbacher) is synonymous with *M. lohsei* Benick, *M. hanseni* Scheerpeltz, *M. strandi* Scheerpeltz, and *M. strandi sensu* Muona (1979), but is a different species from that listed from central Europe by Benick and Lohse (1974) under the same name. Following Klimaszewski et al. (2007) we employ the tentative name *M. "pallens"* (Redtenbacher) *sensu* Benick and Lohse (1974) for this specimen pending revisionary studies in Europe.

Klimaszewski et al. (2007) reported a specimen in Ontario collected in a muskrat nest near a *Sphagnum* bog. The Nova Scotia specimen was collected in wet moss in a gypsum sinkhole. Muona (1991: 231) says that, "This species seems to live more or less subterraneously. It has been taken from burrows of small mammals and can be found by sieving rich soils around trees early in the spring as well as in flood refuse". *Meotica pallens* (Redtenbacher) *sensu* Muona, 1991 is wing-dimorphic, with both brachypterous and macropterous forms. The Nova Scotia specimen is macropterous. A dorsal habitus photograph is provided in Fig. 4. For illustrations of the genitalia see Klimaszewski et al. (2007).

***Gnypeta caerulea*** (C.R. Sahlberg, 1830)

*Gnypeta caerulea,* hitherto regarded as an adventive Palaearctic species, was newly recorded in Nova Scotia, Prince Edward Island, and the Maritime Provinces as a whole

by Majka and Klimaszewski (2008). Subsequently Klimaszewski et al. (2008b) have reviewed the genus *Gnypeta* in Canada, Alaska, and Greenland and concluded that *G. caerulea* represents a Holarctic species. Consequently, it is removed from the list of adventive species of the Maritime Provinces.

***Atheta (Datomicra) dadopora*** Thomson, 1867

**PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 18.VIII.2002, C.G. Majka, along stream, (1, CGMC).

*Atheta dadopora* is newly recorded on Prince Edward Island (Fig. 5). It has previously been recorded from Rhode Island, Pennsylvania, New York, Newfoundland, New Brunswick, and Nova Scotia (Gusarov 2003, Klimaszewski et al. 2005; Majka and Klimaszewski 2008). It is widely distributed across the Palaearctic region eastward to China and Japan (Smetana 2004a) and is found in decaying fungi, under cow dung, and fallen leaves (Burakowski et al. 1981). Although Gusarov (2003) listed it as an adventive Palaearctic species newly recorded in North America, its zoogeographic

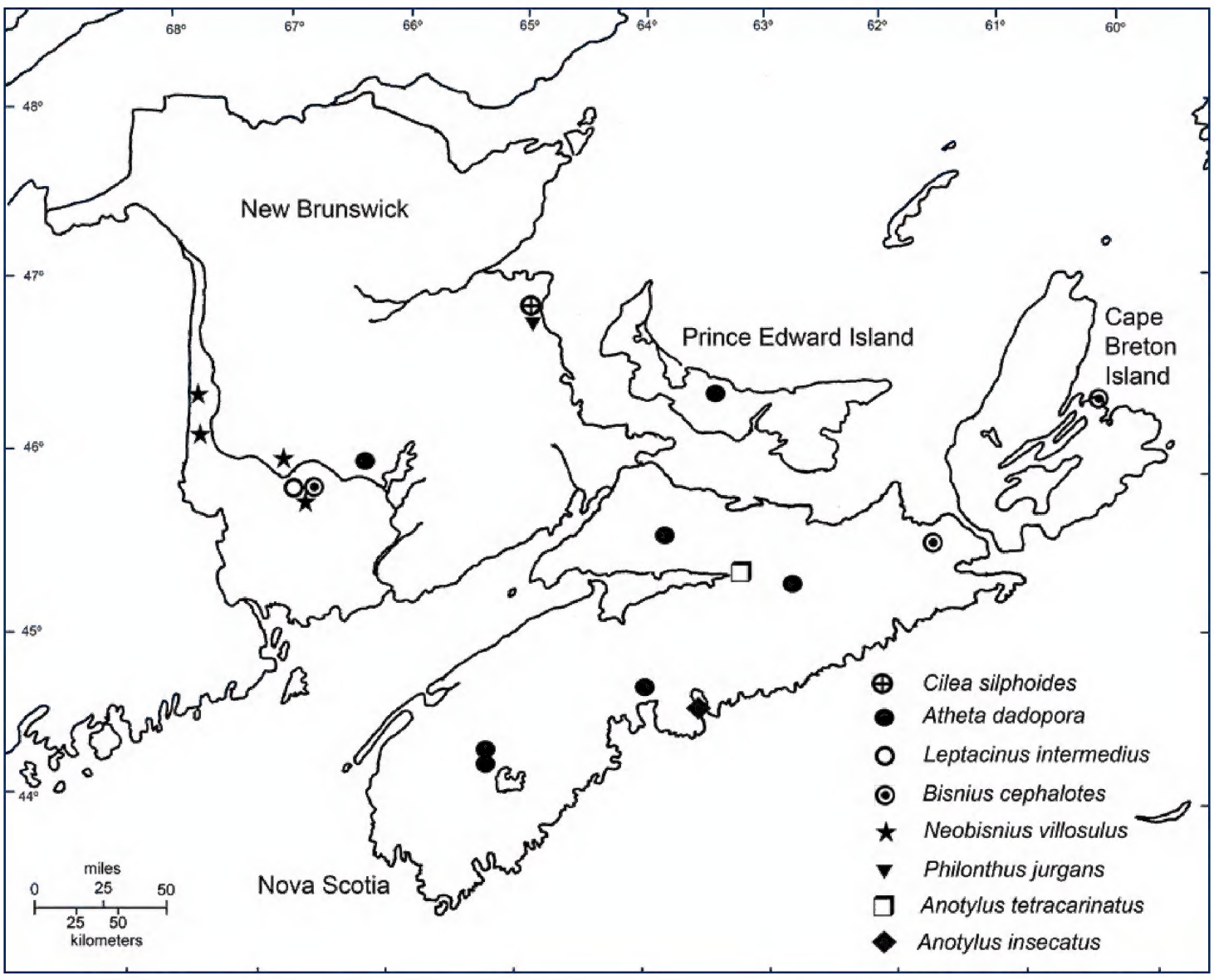


**Fig. 5.** Distribution of *Cilea silphoides, Atheta dadopora, Leptacinus intermedius, Bisnius cephalotes, Neobisnius villosulus, Philonthus jurgans, Anotylus tetracarinatus,* and *Anotylus insecatus* in the Maritime Provinces of Canada.

status is still unclear. It is possible that it could be Holarctic in distribution. It is provisionally included in this account as a Palaearctic species. The earliest records are from Casey (1910) from specimens collected in New York, Pennsylvania, and Rhode Island (Gusarov 2003).

***Anotylus insecatus*** (Gravenhorst, 1806)

**NOVA SCOTIA: Halifax Co.:** Halifax, V-VII.2007, C.G. Majka, garden, (many individuals); Halifax, 25.V.2008, C.G. Majka, garden, (2, CGMC); Halifax, 1.VI.2008, C.G. Majka, garden (1, CGMC); Halifax, 7.VII.2008, C.G. Majka, garden, (1, CGMC).

*Anotylus insecatus* is newly recorded for Nova Scotia and in the Maritime Provinces (Fig. 5). This species was first recorded in North America by Campbell and Tomlin (1983) from specimens collected in Ontario in 1980. It was subsequently reported from Québec by Campbell and Davies (1991). Anthony Davies (pers. comm.) indicates that the CNC also has specimens from Alberta, Manitoba, Saskatchewan, and California and that the earliest records (from Alberta) date from 1954.

Horion (1963) and Campbell and Tomlin (1983) both drew attention to *A. insecatus* as a predator of dipteran larvae in the bulbs of onions and tulips. It has also been found at sap flows and in decaying plant debris (Campbell and Tomlin 1983). Hammond (1976), however, noted that the species is primarily subterranean and believed that, like many species of *Anotylus*, it may be largely saprophagous and a scavenger. He indicated that as an inhabitant of dung and decaying organic matter, its association with dipteran larvae may be incidental. Observations by C.G. Majka in Halifax indicate that they are predators of dipteran larvae. The roots of radish plants (*Raphanus sativus* L., Brassicaceae) infested with the larvae of radish root maggot [*Delia* nr. *floralis* (Fallén) (Diptera: Anthomyiidae)] were examined and adult *A. insecatus* were found preying on larvae in tunnels bored in the roots by the larvae. Adults were also frequently found in subterranean circumstances within soil along with *Gabrius picipennis* (Mäklin) (Staphylinidae).

***Anotylus tetracarinatus*** Block, 1799

**NOVA SCOTIA: Colchester Co.:** Bible Hill, 8.VII.2007, C.W. D'Orsay, pasture, sweep, (1, CBU).

*Anotylus tetracarinatus* is newly recorded for Nova Scotia and in the Maritime Provinces (Fig. 5). It was first recorded in North America in Indiana by LeConte (1877). It has subsequently been reported from New York (Notman 1920), British Columbia, Oregon, and Washington (Hatch 1957), and Québec by (Campbell and Davies 1991; Levesque and Levesque 1996). It is widely distributed in Europe east to Russia and south to Algeria, Turkey, and Iran (Herman 2001). In Europe it has been found in dung, mammal nests, caves, and decomposing fungi (Herman 2001).

***Oxytelus sculptus*** Gravenhorst, 1806

**NOVA SCOTIA: Kings Co.:** Kentville, 27.VII.2007, D.H. Webster, at light, (1, DHWC); Kentville, 12.VIII.2007, D.H. Webster, at light, (1, DHWC).

This species is newly recorded for Nova Scotia and the Maritime Provinces (Fig. 1). In North America it previously has been reported from British Columbia, California, Idaho, Oregon, and Washington on the west coast, and Connecticut, Florida, Indiana, New York, Ontario, and Québec in the eastern portions of the continent (Moore and Legner 1975; Campbell and Davies 1991; Downie and Arnett 1996). Probably originally African in origin, this species is now cosmopolitan being widely distributed in Europe, Africa, North America, temperate south America, Australia, and New Zealand (Herman 2000). Melsheimer (1846: 42) described it under the name of *Oxytelus moerens* from the United States; however, the earliest record of this species in North America is from latrine excavations in Boston, Massachusetts from ca. 1670 (Bain 1998).

It is usually found in open areas such as gardens, pastures, and fields under stones, and in manure and compost (Burakowski et al. 1979). It is abundant in the manure of domestic animals such as cattle, horses, and poultry. It is probable that this cosmopolitan species has been dispersed by human agency in association with the transport of domestic animals (Moore and Legner 1974).

***Lathrobium (s. str.) fulvipenne*** (Gravenhorst, 1806)

**BRITISH COLUMBIA:** 8 miles west of Creston, VI.1968, J.M. Campbell and A. Smetana, (1, CNC). **ALBERTA: Strathcona Co.:** Edmonton, University Farm, 1984, C.D. Griffiths, canola plot, (1, UASM). **NEWFOUNDLAND**: Corner Brook, Loggers School Road, VII.1992, CFNL; St. John's, 1986, (1, MUN). **NEW BRUNSWICK: Albert Co.:** Shepody National Wildlife Area, V.2004, R.P. Webster, RWC; **Restigouche Co.:** Southeast Upsalquitch River, 16.V.1991, D.F. McAlpine, (1, NBM); **York Co.:** Charters Settlement, IV.2005, R.P. Webster, (1, RWC). **QUÉBEC: Haut-Saint-François**; Scotstown, 15.V.2006, 19.VI.2006, 26.VI.2006, 14.V.2007, C. Levesque, abandoned pasture and mixed woodland, pitfall trap, (5, CLC).

Campbell and Davies (1991) indicated the presence of *Lathrobium fulvipenne* in British Columbia, Alberta, and Newfoundland, however, no specimen records were provided. We, therefore, take the opportunity to document its presence (from as early as 1968) from five Canadian provinces. Records from New Brunswick, Newfoundland, and Québec are shown in Fig. 1. It is widely distributed throughout the Palaearctic region (Alonso-Zarazaga 2007). It has also been recorded once in Greenland, although it is not clear if this represents an accidental introduction or if the species is native there (Böcher 1988).

In Iceland and the Faroe Islands it is found in dry grasslands; however, in the rest of Europe it is found in moister environments, i.e., under fallen leaves in coppices or small woods, in leaf litter in alder groves, and in meadows (Böcher 1988). In continen-

tal Europe, it is eurytopic and also common in synantropic habitats (V. Assing, pers. comm). Eyre et al. (2001) found *L. fulvipenne* to be abundant in riverine environments in northern England and Scotland similar to the site where the species was found in New Brunswick.

***Leptacinus intermedius*** Donisthorpe, 1936

**NEW BRUNSWICK: York Co.:** Charters Settlement, 45.8395 N, 66.7391 W, 26.IX.2005, 2.V.2004, 16.X.2004 (2 specimens), 21.IV.2004, 16.IX.2005, 27.VIII.2005, R.P. Webster, in well-decayed compost, (7, RWC).

Majka and Klimaszewski (2008) removed this species from the New Brunswick faunal list, based on a misidentified specimen reported in Majka and Ogden (2006). However, the above records of R.P. Webster establish the presence of *L. intermedius* in the province (Fig. 5). Consequently, *L. intermedius* is reinstated to the faunal list of New Brunswick. The earliest North American specimens are from 1903 in Québec (Smetana 1982). Widely distributed in Europe and found in North Africa and Turkey (Herman 2001; Smetana 2004b), it has been recorded in a wide variety of decompositional environments including dung, compost, and decaying vegetable matter (Smetana 1982).

***Quedius curtipennis*** Bernhauer, 1908

**NOVA SCOTIA: Colchester Co.:** Truro, 8.VI.1984, J.A. Adams, (2, NSAC).

This species was detected in the Maritime Provinces (Nova Scotia) in 1997 (Majka and Smetana 2007). The new record above, however, establishes that *Q. curtipennis* has been present in the region from at least 1984. The earliest records in North America are from 1934 in Seattle (Smetana 1971). In the Palaearctic region it is found throughout Europe east through Turkey to Uzbekistan, as well as in Morocco and on the Azores (Herman 2001, Smetana 2004). *Quedius curtipennis* is often found near settlements in various debris and under stones. Some specimens also have been collected in natural environments in moss and under leaf litter (Smetana 1971).

***Quedius molochinus*** (Gravenhorst, 1802)

**PRINCE EDWARD ISLAND: Queens Co.:** Harrington, 7.IX.2006, C. Noronha, potato field, pitfall trap, (1, CGMC).

Majka and Klimaszewski (2008) neglected to note that *Q. molochinus* also is known on Prince Edward Island (in addition to Nova Scotia) from a specimen collected in 2006 (Majka 2007). Therefore, this species is added to the list of adventive staphylinids found on Prince Edward Island. *Quedius molochinus* was first discovered 1949 in North America in Newfoundland (Smetana 1971). It is widely distributed in Europe

and Russia south to North Africa and the Caucasus (Herman 2001; Smetana 2004b). All North American specimens have been found in land affected by cultivation (Smetana 1971; Majka 2007).

***Creophilus maxillosus villosus*** (Gravenhorst, 1802)

*Creophilus maxillosus* (Linnaeus, 1758) has been treated as an adventive species (Majka and Klimaszewski 2008). Newton et al. (2000), however, pointed out that most North American specimens, often treated as the subspecies *C. maxillosus villosus* (Gravenhorst, 1802), are distinguishable from the Palaearctic *C. m. maxillosus*. *Creophilus m. villosus* has a broad pre-human North American distribution, and hence can be considered a native, Nearctic subspecies. Consequently we remove *C. maxillosus* from the list of adventive species of the region.

***Staphylinus ornaticauda*** LeConte, 1863

*Staphylinus ornaticauda* was inadvertently included in the table of adventive Staphylinidae given by Majka and Klimaszewski (2008: 72). The species was previously treated in North America as *Staphylinus erythropterus* L., 1758, a Palaearctic species and was accidentally retained on the list of adventive species. *Staphylinus ornaticauda* is a native, Nearctic species.

***Tasgius ater*** (Gravenhorst, 1802)

**NEW BRUNSWICK: Westmoreland Co.**: Salisbury, 1.VII.1949, E.A.E., (1, NSAC).
**NOVA SCOTIA: Annapolis Co.:** Bridgetown, 17.IX.1913, G.E. Saunders, (1, NSAC).

Majka and Klimaszewski (2008) reported the detection of *T. ater* in the Maritime Provinces (Nova Scotia) in 1938. The above record from 1913, however establishes its presence in the region at least 25 years earlier. Similarly, the earliest record from New Brunswick was 1978 (Majka and Klimaszewski 2008) but the above record from Salisbury establishes its presence in 1949. It was first recorded in North America by Gravenhorst (1802). *Tasgius ater* is found throughout Europe, Russia, and North Africa east to Syria and Iran (Herman 2001; Smetana 2004) and occurs beneath stones and wood near water (Downie and Arnett 1996).

***Bisnius cephalotes*** (Gravenhorst, 1802)

**NEW BRUNSWICK: York Co.:** New Maryland, 15.IV.2004, R.P. Webster, in compost in mixed forest area, (3, RWC).

*Bisnius cephalotes* is newly recorded from New Brunswick (Fig. 5), previously having been reported from the region from Nova Scotia (Smetana 1995; Majka and Klimaszewski 2008). In the Old World it is widely distributed across the Palaearctic region, south to North Africa and east through Siberia to northeastern China (Herman 2001; Smetana 2004b; Alonso-Zarazaga 2007). In North America, however most records are either from the northeast or the northwest (Smetana 2006). The earliest North American records are from 1860 in Québec (Bain 1999). *Bisnius cephalotes* is a synanthropic species frequently found in various decaying plant or animal material such as carrion, compost, and dung. It is also found in bird and rodent nests (Smetana 1995).

***Neobisnius villosulus*** (Stephens, 1833)

**NEW BRUNSWICK: Carleton Co.:** Bell Forest Nature Preserve, 46.2152 N, 67.7190 W, 1.VI.2005, M.-A. Giguere and R.P. Webster, upper river margin, collected while in flight on warm afternoon, (1, RWC); Two mile Brook Fen N of Lakeville, 46.3594 N, 67.6800 W, 2.VI.2005, R.P. Webster, near cedar swamp, in flight late afternoon, (1, RWC); **York Co.:** Charters Settlement, 45.8395 N, 66.7391 W, 1.VIII.2007, R.P. Webster, collected at M.V. light, (1, RWC); Keswick River at Rte 105, 45.9943 N, 66.8337 W, 18.VI.2004, R.P. Webster, silver maple forest under debris on muddy soil near small pool, (1, RWC).

Majka and Klimaszewski (2008) reported this species in New Brunswick on the basis of a specimen collected in Hartland by R.P. Webster. This identification was in error and was based on a specimen of *Stictolinus flavipes* Donisthorpe. However, the above specimens collected by R.P. Webster establish the presence of *N. villosulus* in New Brunswick (Fig. 5). The earliest North American records are from 1860 in Québec (Bain 1999). It is widely distributed in Europe east to Russia, the Ukraine, and the Caucasus (Herman 2001; Smetana 2004b). It is found mainly in moist habitats including the margins of rivers, marshes, and lakes (Newton et al. 2000).

***Philonthus cognatus*** Stephens, 1832

**NOVA SCOTIA: Kings Co.:** Kentville, 5.VI.1949, D. Eidt, (1, NSAC); Kentville, 23.V.1950, V.R. Vickery, (1, NSAC); Kentville, 25.V.1950, P.N. Grainger, (2, NSAC).

Majka and Klimaszewski (2008) reported the detection of this species in the Maritime Provinces (Nova Scotia) in 1951. The above records establish that *P. cognatus* was present in the region from at least 1949. It was first recorded 1884 in North America in North Carolina (Horn 1884). Widely distributed in the Palaearctic across Europe to eastern Siberia and Jilin in China, it is found in a wide range of habitats that include forests, moist meadows, fields, edges of ponds, and marshes, particularly in rotting plant debris (Smetana 1995).

***Philonthus jurgans*** Tottenham, 1937

**NEW BRUNSWICK: Kent Co.:** Kouchibouguac National Park, 25.VIII.1977, S.J. Miller, (1, CNC).

*Philonthus jurgans* was inadvertently missed in the compendium of adventive species in Majka and Klimaszewski (2008). It was recorded from New Brunswick by Smetana (1995) on the basis of the record above (Fig. 5). In Europe it is found from France east to Albania and Romania and north to Great Britain and Sweden (Herman 2001; Alonso-Zarazaga 2007). Most North American records are from Pennsylvania to Newfoundland and from California north to British Columbia. The earliest records on the continent are from 1881 in Head Harbour, Maine and it is found in all kinds of decaying organic matter (Smetana 1995).

***Philonthus rectangulus*** Sharp, 1874

**NOVA SCOTIA: Kings Co.:** Grand Pré, 19.VII.1952, F.L. Trenholm, (1, NSAC).

Majka and Klimaszewski (2008) recorded *P. rectangulus* from Nova Scotia from specimens collected in 2004. The above record establishes the presence of this species in the province in 1952, 52 years earlier than previously reported, and 25 years earlier than the previous earliest record from the Maritime Provinces in 1977 from New Brunswick (Majka and Klimaszewski 2008). It appears to originally have been native to Japan before spreading to China in 1901, arriving in Europe in 1916. The earliest records from North America are from 1908 in Oregon (Smetana 1995). It now is widely distributed across the Palaearctic region, including China and Japan in the east. It is also known from many other parts of the world and is considered a cosmopolitan species (Herman 2001; Smetana 2004b). It is found in all kinds of decaying organic matter, particularly in synanthropic situations, and is particularly common in animal dung, compost, and rotting plant debris (Smetana 1995).

## Discussion

Eighty-seven species of adventive Staphylinidae are now known to occur in the Maritime Provinces, 76 of which have been recorded in Nova Scotia, 61 in New Brunswick, and 29 on Prince Edward Island (Appendix 1).

Majka and Klimaszewski (2008) discussed the different modes of introduction and dispersal of adventive Staphylinidae in the region. Seventy-six of the 439 species (17.3%) of rove beetles recorded in Nova Scotia are adventive, as are 61 of 348 (17.5%) recorded in New Brunswick, and 29 of 86 (33.7%) recorded on Prince Edward Island. By comparison, the overall proportion of adventive beetles in Nova Scotia is 15.3%, in New Brunswick 12.5%, and on Prince Edward Island 21.8% (C.G. Majka, unpublished data). The significantly larger proportion of adventive

staphylinids on Prince Edward Island, almost double that of New Brunswick and Nova Scotia, appears to reflect in part the extensive disturbance history of the island. Significant cutting of the forests commenced on Prince Edward Island in the early eighteenth century and large areas of the island were burnt. Seventy percent of PEI's forests were cleared in the twentieth century (Loo and Ives 2003). By 1960, 60% of the land on PEI was devoted to agriculture and a further 8% was otherwise open (unimproved waste land, marsh, barren, etc.), leaving only 32% as forest (Erskine 1960). Additionally, what collecting there has been on Prince Edward Island has often focused on disturbed and agricultural biotypes, where adventive species tend to be found, and not on undisturbed and native environments that may harbour more indigenous species.

Table 1 gives the geographical composition of the staphylinid fauna of Atlantic Canada. Although this data is preliminary, the information in Table 1 nonetheless illustrates some noteworthy patterns, particular when compared with the equivalent data pertaining to the Carabidae of Atlantic Canada (Majka et al. 2007b). The Carabidae are another species-rich family of ground-dwelling beetles, one that has been much more thoroughly studied. With 560 species recorded from Atlantic Canada, the Staphylinidae outnumber the 356 species of Carabidae found in the region. There are, however, some striking similarities in the proportionate species compositions. The proportion of native carabids in Atlantic Canada varies from 83.8 to 91.2%, whereas in the Staphylinidae, the proportion of native species varies from 78.9 to 83.6%, except for 66.3% in Prince Edward Island, another indication that PEI's native fauna is strikingly underrepresented in collections.

Furthermore, within the Carabidae of the region, the recorded numbers and proportions of native species on the islands of Cape Breton (170 species, or 53.5% of the total number of native species), Newfoundland (148 species, or 46.5%), and Prince Edward Island (140 species, or 44%) are relatively similar. For the Staphylinidae the equivalent numbers for Cape Breton (169 of 468 species, or 36.0% of the total native fauna) and insular Newfoundland (153 of 468 species, or 32.6% of the total native fauna) are relatively similar, whereas those for Prince Edward Island (57 of 468 species, or 12.2% of the total native fauna) again reveal that the recorded native staphylinid fauna is proportionally much smaller (only 1/3 of the value), indicating that the native rove beetle fauna has not been adequately collected.

Noteworthy as well, is the relatively large proportion of Holarctic staphylinids on insular Newfoundland, which at 14.9% is roughly double that of any other area in Atlantic Canada. This is comparable to the proportion of Holarctic carabids on Newfoundland (21.2%), which is also roughly double that of any other area in Atlantic Canada, illustrating Newfoundland's more northern situation and its greater proximity to Labrador, Greenland, Iceland, etc. with their sizable Holarctic faunas.

Comparing the numbers and proportions of adventive carabids and staphylinids reveals a similar picture. Cape Breton (23 species), Newfoundland (22 species), and Prince Edward Island (27 species) have similar numbers of adventive carabids. The number of adventive staphylinids on Cape Breton (44 species) and Newfoundland (41

**Table 1.** Zoogeographic composition of the Atlantic Canadian Staphylinidae: Number and proportion of species

| | Nearctic | % of total | Holarctic | % of total | Palaearctic | % of total | Native | % of total | Total |
|---|---|---|---|---|---|---|---|---|---|
| Prince Edward Island | 50 | 58.1% | 7 | 8.1% | 29 | 33.7% | 57 | 66.3% | 86 |
| Cape Breton Island | 160 | 75.1% | 9 | 4.2% | 44 | 20.7% | 169 | 79.3% | 213 |
| insular Newfoundland | 124 | 63.9% | 29 | 14.9% | 41 | 21.1% | 153 | 78.9% | 194 |
| Nova Scotia mainland | 269 | 74.7% | 18 | 5.0% | 73 | 20.3% | 287 | 79.7% | 360 |
| Nova Scotia | 336 | 76.5% | 27 | 6.2% | 76 | 17.3% | 363 | 82.7% | 438 |
| New Brunswick | 259 | 74.4% | 28 | 8.0% | 61 | 17.5% | 287 | 82.5% | 348 |
| Maritime Provinces | 392 | 76.7% | 32 | 6.3% | 87 | 17.0% | 424 | 83.0% | 511 |
| Atlantic Canada * | 430 | 76.8% | 38 | 6.8% | 92 | 16.4% | 468 | 83.6% | 560 |

* excluding Labrador

**Notes:** Data derived primarily from Campbell and Davies (1991), Gusarov (2003), Assing (2003), Smetana (2005), Klimaszewski et al. (2005, 2007), Gouix and Klimaszewski (2007), Majka and Klimaszewski (2008), and unpublished information.
The Maritime Provinces include New Brunswick, Nova Scotia and Prince Edward Island. Atlantic Canada additionally includes insular Newfoundland.

species) are very similar, whereas Prince Edward Island (29 species) is a third lower. In relation to both carabids (24 of the total of 38 adventive species, i.e., 63%) and staphylinids (61 of the total of 92 adventive species, i.e., 66%) New Brunswick has a diminished proportion of adventive species in comparison with Nova Scotia (89.5 and 82.6% respectively) and the Maritime Provinces as a whole (89.5 and 94.6% respectively). Presumably this disparity is a result of the lesser role of New Brunswick's seaports in the trans-Atlantic ballast trade.

## Conclusion

The new discoveries highlighted in the present study illustrate several trends in our research on adventive species in Atlantic Canada, namely that a) new species continue to be discovered, b) examination of museum specimens continues to yield new early time lines for the detection of species in the region, c) ongoing research on staphylinids continues to result in reevaluations of the zoogeographic status of species, and d) further fieldwork and systematic research are needed to fully understand the composition of the region's fauna, particularly for the Staphylinidae. Although we are continually discovering that the number of adventive species and the extent of their penetration into native habitats is greater than we had anticipated, our knowledge of the composition of staphylinid faunas remains incomplete. Hence our ability to assess the impact that these adventive species may have had on native faunas and habitats is similarly limited.

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## **Appendix 1.** Adventive Staphylinidae of the Maritime Provinces of Canada

**Omaliinae**
Omaliini
*Omalium rivulare* (Paykull)
*Phyllodrepa floralis* (Paykull)

**Pselaphinae**
Euplectitae
Euplectini
*Euplectus karstenii* (Reichenbach)

**Phloeocharinae**
*Phloeocharis subtilissima* Mannerheim

**Tachyporinae**
Tachyporini
*Cilea silphoides* (Linnaeus)
*Sepedophilus littoreus* (Linnaeus)
*Sepedophilus marshami* (Stephens)
*Sepedophilus testaceus* (Fabricius)
*Tachinus corticinus* Gravenhorst
*Tachinus rufipes* (Linnaeus)
*Tachyporus dispar* (Paykull)
*Tachyporus nitidulus* (Fabricius)

Mycetoporini
*Mycetoporus lepidus* (Gravenhorst)

**Trichophyinae**
*Trichophya pilicornis* (Gyllenhal)

**Habrocerinae**
*Habrocerus capillaricornis* (Gravenhorst)

**Aleocharinae**
Aleocharini
subtribe Aleocharina
*Aleochara bilineata* Gyllenhal
*Aleochara fumata* Gravenhorst
*Aleochara lanuginosa* Gravenhorst
*Aleochara tristis* Gravenhorst
*Aleochara curtula* (Goeze)
*Tinotus morion* (Gravenhorst)
Oxypodini
subtribe Oxypodina
*Crataraea suturalis* (Mannerheim)
*Ilyobates bennetti* Donisthorpe
*Oxypoda brachyptera* (Stephens)
*Oxypoda opaca* (Gravenhorst)
*Oxypoda operta* Sjöberg
*Meotica exilis* (Erichson)
*Meotica "pallens"* (Redtenbacher)

Dioglottini
*Dioglota mersa* (Haliday)

Autaliini
*Autalia rivularis* (Gravenhorst)

Homalotini
subtribe Gyrophaenina
*Gyrophaena affinis* Mannerheim
subtribe Homalotina
*Homalota plana* Gyllenhal

Placusini
*Placusa incompleta* Sjöberg
*Placusa tachyporoides* (Waltl)

Athetini
subtribe Athetina
*Amischa analis* (Gravenhorst)
*Atheta longicornis* (Gravenhorst)
*Atheta celata* (Erichson)
*Atheta dadopora* Thomson
*Atheta amicula* (Stephens)
*Atheta vestita* (Gravenhorst)
*Dinaraea angustula* (Gyllenhal)
*Halobrecta flavipes* Tomson
*Mocyta fungi* (Gravenhorst)
*Nehemitropia lividipennis* (Mannerheim)

Falagriini
*Cordalia obscura* (Gravenhorst)

Lomechusini
subtribe Myrmedoniina
*Drusilla canaliculata* (Fabricius)

Oxytelinae
Deleasterini
*Deleaster dichrous* (Gravenhorst)
*Coprophilus striatulus* (Fabricius)

Thinobiini
*Carpelimus obesus* (Kiesenwetter)
*Carpelimus subtilis* (Erichson)

Oxytelini
*Anotylus insecatus* (Gravenhorst)
*Anotylus rugosus* (Fabricius)
*Anotylus tetracarinatus* Block
*Oxytelus laqueatus* (Marsham)
*Oxytelus sculptus* Gravenhorst

**Steninae**
*Stenus clavicornis* (Scopoli)

**Paederinae**
Paederini
*Lathrobium fulvipenne* (Gravenhorst)
*Lithocharis ochracea* (Gravenhorst)
*Rugilus fragilis* (Gravenhorst)
*Ochthephilum fracticorne* (Paykull)

**Staphylininae**
Xantholinini
*Gyrohypnus angustatus* Stephens
*Gyrohypnus fracticornis* (O.F. Müller)
*Leptacinus intermedius* Donisthorpe
*Xantholinus linearis* (Olivier)

Staphylinini
Quediina
*Quedius curtipennis* Bernhauer
*Quedius fuliginosus* (Gravenhorst)
*Quedius mesomelinus* (Marsham)
*Quedius molochinus* (Gravenhorst)

Staphylinina
*Tasgius ater* (Gravenhorst)
*Tasgius melanarius* (Heer)

Philonthina
*Bisnius cephalotes* (Gravenhorst)
*Bisnius sordidus* (Gravenhorst)
*Gabrius appendiculatus* Sharp
*Gabrius astutoides* (Strand)
*Neobisnius villosulus* (Stephens)
*Philonthus carbonarius* (Gravenhorst)
*Philonthus cognatus* Stephens
*Philonthus concinnus* (Gravenhorst)
*Philonthus cruentatus* (Gmelin)
*Philonthus debilis* (Gravenhorst)
*Philonthus discoideus* (Gravenhorst)
*Philonthus jurgans* Tottenham
*Philonthus longicornis* Stephens
*Philonthus politus* (Linnaeus)
*Philonthus rectangulus* Sharp
*Philonthus umbratilis* (Gravenhorst)
*Philonthus varians* (Paykull)